7 Mojave Desert Region

Jim Little

The vast Mojave Desert's more than 32 million acres extend into four states: California, Nevada, Arizona, and Utah. Within California, the Mojave Region's 20 million acres cover one-fifth of the state, spanning an area larger than the counties of San Diego, Orange, Los Angeles, Imperial, Riverside, Ventura, Santa Barbara, and San Luis Obispo combined.

About 80 percent of the Mojave Desert in California is managed by federal agencies, each of which has differing sets of missions that often expand beyond wildlife conservation. The Bureau of Land Management (BLM), the largest land manager of the region, oversees 8 million acres, or 41 percent, of the federally owned sector. The National Park Service manages the Mojave National Preserve and Death Valley and Joshua Tree national parks, which account for another 26 percent of the region. The Department of Defense manages five military bases that cover about 13 percent of the region. State Parks and Fish and Game wildlife areas account for just 0.32 percent of the region. About 18 percent of the region belongs to private landowners or municipalities (CRA 1998, 2004).

Lying in the rain shadow of the southern Sierra Nevada and Southern California's Transverse and Peninsular Ranges, the dry Mojave landscape is highlighted by dramatic geologic features, encompassing peaks, cliffs, canyons, dry washes, sand dunes, and large playas. Variations in elevation and soil composition and different orientations to the wind and sun, along with desert springs, moist seeps, and two major riparian corridors, provide isolated microclimates and ecosystems throughout the region. The harsh yet diverse environment of the Mojave has facilitated the evolution of numerous **endemic** and specially adapted species of plants and wildlife on islands of unique habitat in a sea of creosote bushes, the most widespread plant community of the state.

Hidden Desert Wildlife

On a typical hot-day's drive through the Mojave Desert, the casual observer may not experience or appreciate the wildlife, which seek shelter and shade to avoid the heat of the day. At dusk, desert horned lizards shake loose from the sandy soil crust to snatch unsuspecting ants. Kangaroo rats with tufted tails emerge from burrows beneath shrubs. Common nighthawks engage in aerial acrobatics. The shudder of the male nighthawk's wings makes a loud whooshing "hoooov" sound as it pulls out of its display dive in the otherwise silent desert dusk. Coyotes begin their hunts, often loping along ridgelines, scanning the desert for cottontail rabbits and ground squirrels, while bats weave in the darkening sky above, scooping up flying insects.

The crescendo of songbird melodies breaks the desert quiet again just before dawn. Sparrows, wrens, and towhees dart among the brush, foraging in the relatively cool morning. Songbirds, shorebirds, wading birds, kingfishers, waterfowl, owls, and hawks inhabit the riparian habitats of the Mojave and Amargosa rivers and desert spring habitats of meandering water, willows, and cottonwoods. The traffic of nocturnal mammals, bobcat, coyotes, skunks, and voles leaves paw prints in sandy soils.

From 282 feet below sea level in Death Valley to altitudes of 11,000 feet in the Panamint Mountains, the range of habitats supports 130 different **plant alliances**. However, the landscape is mostly a moderately high plateau at elevations between 2,000 and 3,000 feet. The common habitats of the region are creosote bush scrub, desert saltbush, Joshua tree scrub, desert wash, alkali scrub, and juniper-pinyon woodlands. Although limited in area, springs, seeps, perennial streams of the Panamint Range's Surprise Canyon and Cottonwood Creek, along with the Amargosa and Mojave rivers, are vital wet habitats supporting wildlife diversity in the region.

The Mojave Desert is home to extraordinary plants and wildlife. The Joshua tree, barrel and prickly pear cacti, and pinyon pine highlight the desert landscape, home to prairie falcons, burrowing owls, desert tortoises, rosy boas, desert horned lizards, collared and leopard lizards, Mohave ground squirrels, kangaroo rats, Mojave River and Amargosa voles, bobcats, kit foxes, mountain lions, and bighorn sheep.

It is the vastness of the Mojave Desert that has given some the impression that it is a wasteland that can endure unlimited adverse impacts to its species, habitats, and ecosystems. Thirty years ago, however, the fragile nature of the desert was well recognized.

> "The vast natural resources of the California desert are today severely threatened by the extent of adverse human intrusion, combined with the natural fragility of the desert ecosystem."
>
> —*The Fragile Balance: Environmental Problems of the California Desert* (Ginsberg et al. 1976)

> "The impact of accelerated human and vehicle activity cannot be overstated. Careless mining operations and improper grazing practices have scarred the land. Unplanned construction and road-building have played a destructive game of tic-tac-toe across the desert's face. Excessive and uncontrolled recreational use are undermining the concept of multiple use and removing the desert from the dwindling list of sanctuaries for many rare and endangered species."
>
> —U.S. Senator Alan Cranston, preface to *Fragile Balance,* 1976

> "The California desert environment is a total ecosystem that is extremely fragile, easily scarred, and slowly healed . . . and its resources, including certain rare and endangered species of wildlife, plants, and fishes, and numerous archeological and historic sites, are seriously threatened by air pollution, inadequate Federal management authority, and pressures of increased use, particularly recreational use, which are certain to intensify because of the rapidly growing population of Southern California."
>
> —Federal Land Policy and Management Act of 1976, Title VI

Since the enactment of the Federal Land Policy and Management Act, the major threats to wildlife populations continue, and new threats have emerged. Wildlife species are at risk, and ecosystems are degraded from the cumulative impact of urban growth, off-highway vehicle activity that adds thousands of miles of dirt roads and trails, cattle and sheep grazing, overdrawn groundwater, illegal harvest or illegal commercialization, and dominance of invasive plants. These activities, events, and conditions have and are continuing to fragment the landscape, degrade wildlife habitat, and disrupt desert ecosystems. Only with sufficiently

large protected ecosystems and coordinated, strategic, and well-funded conservation actions will wildlife recovery be achieved.

Numerous public agencies, private organizations, and landowners are involved in wildlife conservation efforts in the Mojave. Since the early 1980s, private conservation organizations such as the Conservation Fund, The Nature Conservancy, and Preserving Wild California have protected thousands of acres of essential habitat for the Mojave Desert's unique plants and animals. Since 1994, the Desert Managers Group (DMG), an interagency group, has served the role of coordinating desert conservation, visitor services, public outreach, and public safety in the region. Initially representing state and federal land management, recreation and wildlife agencies, and the Department of Defense, in 2005 the DMG expanded to include participants from the desert counties. Fish and Game participates in and contributes funds to the DMG. The DMG provides an important regionwide forum for facilitation of conservation efforts. It is involved in identifying research needs, conservation planning, restoration projects, and conservation programs and helps to secure funding for these efforts.

Species at Risk

The Plan development team updated vertebrate and invertebrate species information in the California Natural Diversity Database (CNDDB) during 2004–2006. The following regional summary of numbers of wildlife species, endemic species, and species at risk is derived from the updated CNDDB.

While the Mojave Desert supports a great diversity of wildlife, accumulated degradation of the desert wildlands over the last several decades has caused many desert species to decline in numbers and distribution, and thus they have been identified as species at risk.

There are 439 vertebrate species that inhabit the Mojave Desert Region at some point in their life cycle, including 252 birds, 101 mammals, 57 reptiles, 10 amphibians, and 19 fish. Of the total vertebrate species that inhabit this region, 69 bird **taxa**, 38 mammalian taxa, 15 reptilian taxa, four amphibian taxa, and nine fish taxa are included on the **Special Animals List.** Of these, 14 are endemic to the Mojave Desert Region, one is endemic to California but introduced to this region, and 15 other species found here are endemic to California but not restricted to this region (Table 7.1).

Table 7.1: State-Endemic Special Status Vertebrates of the Mojave Desert Region

	Anniella pulchra pulchra	Silvery legless lizard
*	*Aphelocoma californica cana*	Eagle Mountain scrub-jay
	Batrachoseps campi	Inyo Mountains slender salamander
	Batrachoseps robustus	Kern Plateau salamander
*	*Bufo exsul*	Black toad
	Charina umbratica	Southern rubber boa
	Cyprinodon nevadensis amargosae	Amargosa pupfish
*	*Cyprinodon nevadensis nevadensis*	Saratoga Springs pupfish
*	*Cyprinodon nevadensis shoshone*	Shoshone pupfish
*	*Cyprinodon salinus milleri*	Cottonball Marsh pupfish
*	*Cyprinodon salinus salinus*	Salt Creek pupfish
*	*Dipodomys merriami collinus*	Earthquake Merriam's kangaroo rat
	Dipodomys panamintinus argusensis	Argus Mountains kangaroo rat
*	*Dipodomys panamintinus anamintinus*	Panamint kangaroo rat
	Elgaria (=Gerrhonotus) panamintinus	Panamint alligator lizard
*	*Gila bicolor mohavensis*	Mohave tui chub
+	*Gila orcutti*	Arroyo chub
	Gopherus agassizii	Desert tortoise
*	*Microtus californicus mohavensis*	Mohave River vole
*	*Microtus californicus scirpensis*	Amargosa vole
	Microtus californicus vallicola	Owens Valley vole
	Onychomys torridus tularensis	Tulare grasshopper mouse
	Perognathus alticolus inexpectatus	Tehachapi pocket mouse
	Perognathus inornatus inornatus	San Joaquin pocket mouse
*	*Perognathus longimembris salinensis*	No common name
	Perognathus parvus xanthonotus	Yellow-eared pocket mouse
*	*Pipilo crissalis eremophilus*	Inyo California towhee
	Rhinichthys osculus ssp. 2	Owens speckled dace
	Spermophilus mohavensis	Mohave ground squirrel
*	*Tamias panamintinus acrus*	Kingston Mountain chipmunk
	Tamias speciosus speciosus	Lodgepole chipmunk

* denotes taxon is endemic to region
+ denotes taxon is endemic to California but introduced in this region

The number of arthropod species is so great, and they are so poorly known taxonomically, that it is presently impossible to accurately estimate the total number of invertebrate

species occurring in the state. In the Mojave Desert Region, however, 29 invertebrate taxa are included on the Special Animals List, including 19 arthropod taxa and 10 mollusk taxa. Of these, 22 are endemic to the Mojave Desert Region, and six other taxa found here are endemic to California but not restricted to this region (Table 7.2).

Table 7.2: State-Endemic Special Status Invertebrates of the Mojave Desert Region

*	*Agabus rumppi*	Death Valley agabus diving beetle
*	*Ambrysus funebris*	Nevares Spring naucorid bug
*	*Ammopelmatus kelsoensis*	Kelso Jerusalem cricket
*	*Assiminea infima*	Badwater snail
*	*Belostoma saratogae*	Saratoga Springs belostoman bug
	Certaochrysis menkei	Menke's chrysidid wasp
	Eremarionta morongoana	Morongo (=Colorado) desertsnail
*	*Eremarionta rowelli bakerensis*	Baker's desertsnail
*	*Fontelicella sp*	Deep Springs fontelicella
*	*Glaresis arenata*	Kelso Dunes scarab glaresis beetle
*	*Helminthoglypta mohaveana*	Victorville shoulderband
	Helminthoglypta taylori	Westfork shoulderband
*	*Hubbardia shoshonensis*	Shoshone Cave whip-scorpion
*	*Ipnobius robustus*	Robust tryonia
*	*Macrobaenetes kelsoensis*	Kelso giant sand treader cricket
*	*Miloderes nelsoni*	Nelson's miloderes weevil
	Myrmosula pacifica	Antioch multilid wasp
*	*Paranomada californica*	Californian paranomada cuckoo bee
*	*Pelocoris biimpressus shoshone*	Amargosa naucorid bug
*	*Plebulina emigdionis*	San Emigdio blue butterfly
*	*Polyphylla anteronivea*	Saline Valley snow-front june beetle
*	*Polyphylla erratica*	Death Valley june beetle
	Psychomastix deserticola	Desert monkey grasshopper
	Pyrgulopsis wongi	Wong's springsnail
*	*Rhopalolemma robertsi*	Roberts' cuckoo bee
*	*Trigonoscuta brunnotesselata*	Brown tassel trigonoscuta weevil
*	*Tryonia margae*	Grapevine Springs elongate tryonia
*	*Tryonia rowlandsi*	Grapevine Springs squat tryonia

* denotes taxon is endemic to region

The Wildlife Species Matrix, including data on listing status, habitat association, and population trend for each vertebrate and invertebrate species included on the Special Animals List, is available on the Web at http://www.dfg.ca.gov/habitats/wdp/matrix_search.asp. For vertebrates, the matrix also includes links to species-level range maps. Additionally, a link to the California Department of Fish and Game's online Field Survey Form is available to assist in reporting positive sightings of species on the Special Animals List to the California Natural Diversity Database (CNDDB).

Three Species at Risk

Note: *The following discussion of three species at risk illustrates how stressors or threats affect species and highlights conservation challenges and opportunities. These species discussions are not intended to imply that conservation should have a single-species approach.*

These three species are highlighted to illustrate how various stressors affect them and their habitats and the challenges of conservation. Some of the species in trouble are like the wide-ranging desert tortoise, suffering from the compounded effects of numerous factors. The Amargosa vole, while affected by several human activities, is at risk due to the loss of grasslands and wet habitat along the Amargosa River corridor. The Mohave ground squirrel is at risk because numerous stressors degrade essential habitat within its limited range.

Desert Tortoise


Don Stehsel

The desert tortoise is the flagship species of the Mojave Desert. The wide-ranging and long-lived tortoise is a herbivore with a diversified diet, occurring in numerous vegetation communities and habitats across the Mojave and Sonoran deserts. The Mojave tortoise population was state listed as threatened in 1989 and federally listed as threatened in 1990. Desert tortoise populations have declined dramatically in the last 25 years. In some areas of occupied habitat, tortoise density has dropped by 50 percent to 90 percent; near some desert towns, they have been almost completely extirpated (Berry 1999, 2003, Jones 2005 pers. comm.).

More than 20 stressors affecting tortoise populations have been identified, and the cause of their decline has been the cumulative impact of human-related activities. Habitat degradation and fragmentation, the increase in exotic plant species, increased fire, collection for pets

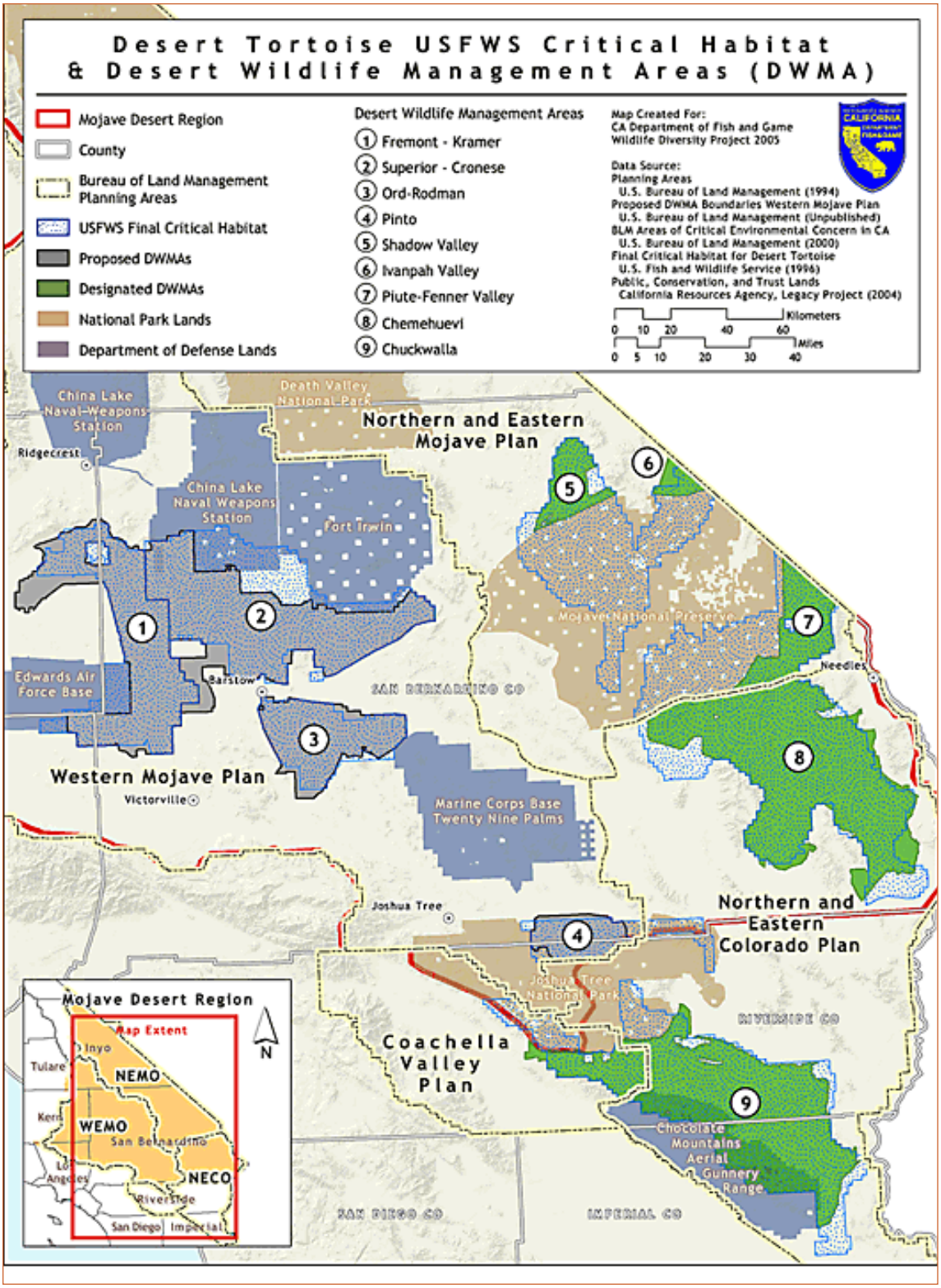


Fig. 7.1: Desert Tortoise critical habitat
Desert Wildlife Management Areas (DWMAs) are the central component of the strategy to protect and recover the desert tortoise.

or food, shooting, crushing by off-road and military vehicles, disease, predation by dogs and by human-induced expanded raven populations, agricultural activities, development of roads, utility corridors, and residential communities have all taken their toll on the tortoise and its habitat (BLM 2005b, DMG 2004, Doak et al. 1994, USFWS 1999).

The explosion of the raven population in the desert illustrates how indirect effects of human activities can disrupt ecological balances. Ravens are both predators and scavengers. They have been described as "bears with wings," because they become pests that feed on human-produced garbage. Ravens proliferate near garbage dumps, sewage ponds, agricultural areas, and along roads, all of which provide unnaturally abundant food, water, perches, and nest sites. Common ravens increased by 1,500 percent in the Mojave Desert between 1968 and 1988 (Boarman and Berry 1995). Ravens consume juvenile tortoises and likely prey upon other less-studied native reptiles. Estimates of tortoise mortality in localized areas due to raven predation range from 9 percent to 72 percent (BLM 2005b, Liebezeit and George 2002).

The life history of the tortoise dictates that even under very favorable conditions, its population may grow at a rate of only 1 percent to 2 percent annually, making recovery very slow. Even with the stressors significantly reduced, it would require 200 years for tortoise numbers to increase from 10 to 80 animals per square mile (USFWS 1994b).

The central strategy for saving the tortoise, pursuant to the 1994 Recovery Plan, has been the establishment of Desert Wildlife Management Areas (DWMAs), designed to provide special protection for the tortoise and other wildlife. The Recovery Plan described the special management actions to be implemented in each DWMA to protect and recover the desert tortoise. However, most of the special management actions have not been implemented or have been only partially implemented. The recovery plan recommended tortoise barrier fencing be installed within the DWMAs where tortoises are prevalent to keep them from being killed on major highways and roads. In the Joshua Tree DWMA that lies nearly entirely within lands managed by the National Park Service, barrier fencing has not yet been installed to protect tortoises. The recovery plan also called for reducing raven numbers in DWMAs to reduce predation on young tortoises, but this has been hindered by legal challenges. The recovery plan called for eliminating livestock grazing to reduce the degradation of tortoise habitat. With the exception of several cattle leases that have been bought out by the U.S. Army as part of the Fort Irwin expansion mitigation and by the Desert Tortoise Preserve Committee, cattle grazing continues on lands within the DWMAs and on desert tortoise critical habitat in the western Mojave. Another action to protect tortoises that has yet to be implemented is to

construct fences in key areas to keep free-roaming dogs out. (Berry 2004 pers. comm., DMG 2002b, Jones 2004 pers. comm., RI 2002b, USFWS 1994b).

In 2004, the desert Tortoise Recovery Plan Assessment Committee, a team of experts assembled by the U.S. Fish and Wildlife Service, completed a report evaluating the science and implementation of the 1994 Recovery Plan. The committee found that the recovery effort over the last decade was unsuccessful, primarily because the plan was only partially implemented. Desert tortoise populations continue to decline, most clearly so in the West Mojave Recovery Unit. The committee concluded that recovery of the tortoise requires additional research on the animal's demography and population dynamics. The inability to implement the original recovery plan is also due to the lack of coordinated and rangewide tracking of implementation (Tracy et al. 2004, USFWS 2004).

The U.S. Fish and Wildlife Service has established a new desert tortoise recovery office and recovery implementation work groups. The Desert Manager's Group is providing coordination of federal, state, and local agencies to assist with desert tortoise recovery and management of natural resources.

Amargosa Vole

Everette Denney

The Amargosa vole has evolved in isolated grasslands and wetland and riparian habitat along segments of the Amargosa River. It is entirely dependent on the future of the wetlands and riparian habitat along the river. Marshes occupied by the vole are separated by desert habitat, limiting its dispersal (CDFG 2005b).

Conversion of wetlands to farmland, diversion of surface water, groundwater pumping that lowers the water table, and the invasion of exotic vegetation have reduced wildlife habitat along the river corridor. As the native grasslands and riparian communities along the Amargosa River have declined, so has its resident vole. The Amargosa vole was state listed and federally listed as endangered in the early 1980s. The increase in groundwater pumping required for the projected growth of upstream Nevada communities threatens to dry up the last vestiges of the voles' habitat, leading to its extinction.

The U.S. Fish and Wildlife Service completed a recovery plan for the vole in 1997. The plan indicated that protection of the wetland habitat along the Amargosa River and main-

taining the water sources for these wetlands is critical to the vole's survival (USFWS 1997a). The Northern and Eastern Mojave Desert Management Plan (NEMO), approved in 2002, emphasizes protection for the watershed of the Amargosa River and identifies five areas along the river that are important for conserving the vole. The NEMO also recommends that segments of the Amargosa River be considered for addition to the National Wild and Scenic River system. Conservation of the Amargosa vole will require protecting important habitats and preventing groundwater overdrafting in the Amargosa River watershed in California and Nevada.

Mohave Ground Squirrel

Endemic to the western Mojave Desert, the Mohave ground squirrel is especially adapted to the hot, dry desert. It is active in spring and early summer, when it forages on leaves and seeds of native plants. In years of good plant forage due to adequate winter rains, the squirrel will produce young. However, in drier years the squirrel foregoes reproduction and instead stores fat for its long dormancy period from mid-summer through February. The squirrel's desert survival adaptations, long seasonal inactive periods, and the skipping of reproduction in drier years make it very difficult for biologists to conduct studies of its distribution and abundance.

Habitat loss and fragmentation due to urban and agricultural development and habitat degradation from livestock grazing, military training activities, off-road vehicle recreation, and invasive grasses are all stressors of the Mohave ground squirrel populations (BLM 2005b, CDFG 2005). (See Fig. 7.2, showing Mohave ground squirrel sightings.) Livestock grazing from February to June coincides with the squirrel's active period. Sheep and cattle consume some of the same plants that are important forage and cover for squirrels (CDFG 2005b).

The degradation and loss of its habitat in its limited range led to its listing as a threatened species under the California Endangered Species Act in 1971. Over the last two decades, a decline in biologists' trapping success has raised concern that the species is still declining (BLM 2005b, Brooks and Pyke 2001). In 1995 the U.S. Fish and Wildlife Service concluded that not enough is known about the squirrel to warrant listing it as threatened or endangered under the federal Endangered Species Act.

Recent field studies have helped to clarify the status and conservation needs of the Mohave ground squirrel. Four core areas have been identified that still support viable populations. These areas make up less than 10 percent of the species range and are widely separated,

leading to concerns regarding habitat fragmentation and genetic isolation. Two of these core areas are on military installations where conservation action is necessarily limited because the species is not federally listed. The Mohave ground squirrel appears to be largely absent from the southern portion of its range and has a very patchy, low-density distribution elsewhere apart from the four known core areas. Potential connections between certain core areas are threatened by changes in land use that contribute to habitat loss and degradation. The present status of the Mohave ground squirrel appears precarious, and current conservation measures are not adequate to ensure its recovery (Leitner 2005 pers. comm.).

Major Stressors Affecting Wildlife and Habitats

- Multiple uses conflicting with wildlife on public lands
- Growth and development
- Groundwater overdrafting and loss of riparian habitat
- Inappropriate off-road vehicle use
- Excessive livestock grazing
- Excessive burro and horse grazing
- Invasive plants
- Military lands management conflicts
- Mining operations

Multiple Uses Conflicting with Wildlife on Public Lands

With four-fifths of California's Mojave region under federal stewardship, the prevailing assumption by local governments is that federal lands provide adequate habitat to maintain wildlife, and that the private and municipal lands are available to be developed. However, the habitats required to sustain wildlife diversity do not correspond to the regional political boundaries. For example, most riparian and spring habitats, critical for wildlife, are on privately owned lands. Their protection depends on both cooperative and incentive-based approaches, as well as the enforcement of state and federal wetlands regulations, and, in the case of the Mojave River, the implementation of the adjudicated water rights agreement. Nevertheless, the Northern and Eastern Mojave Desert Management Plan (NEMO), the Desert Tortoise Recovery Plan, and the proposed West Mojave Plan (WMP) rely principally on federal lands management for maintaining healthy wildlife populations.

Federal policy dictates that BLM manage its lands to accommodate multiple uses. Many of these uses conflict with wildlife conservation, damaging the fragile desert habitats. (See Fig. 7.2,

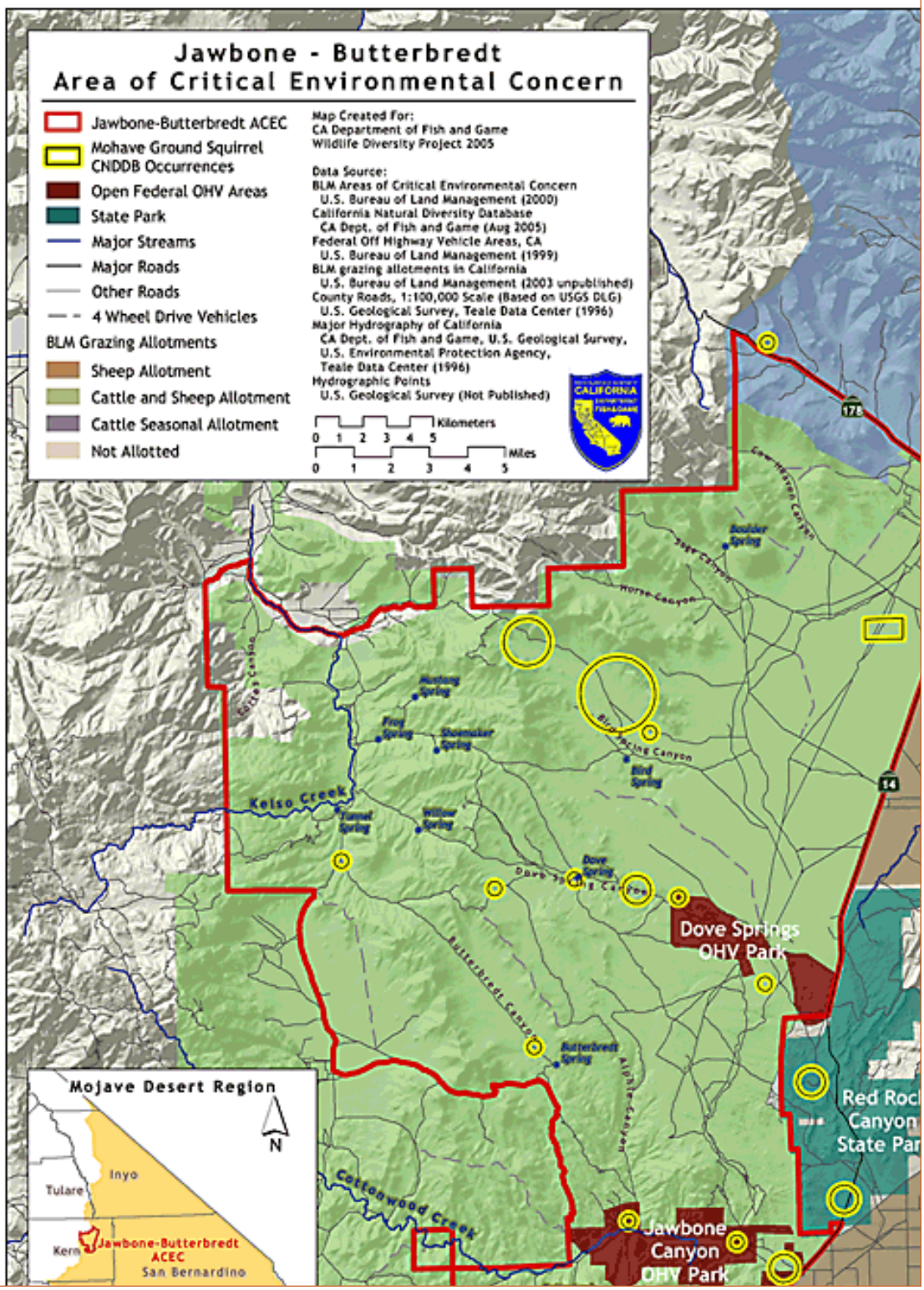


Fig 7.2: Multiple-use conflicts within the Jawbone-Butterbredt ACEC
The Jawbone-Butterbredt Area of Critical of Environmental Concern is an example of an area where accommodating multiple land-uses causes degradation of wildlife resources. In this case, there are off-road areas and livestock grazing allotments overlapping or adjacent to riparian and other sensitive habitats. Circled areas indicate Mohave ground squirrel sites.

Multiple-Use Conflicts within the Jawbone-Butterbredt ACEC.) The Federal Land Policy and Management Act of 1976 broadened BLM's purposes to include preserving public lands in their wild condition and required BLM to prepare a comprehensive long-range plan for the California Desert Conservation Area, which covers both the Mojave and Colorado Desert regions. Among the goals of the plan, completed in 1980, was for BLM to maintain environmental quality and to protect endangered and threatened species of plants and wildlife while accommodating grazing, mining, and recreational activities. However, some land uses that degrade habitat are incompatible with restoring habitat and conserving species (Lovich and Bainbridge 1999, Tracy et al. 2004, USGAO 1989, 1991a, 1991b).

The California Desert Conservation Area (CDCA) Plan set out to protect wildlife and sensitive habitats primarily by establishing Areas of Critical Environmental Concern (ACEC), various wildlife habitat management areas, and large units of limited use. Enforcing grazing and off-road vehicle restrictions was a high priority within these areas. ACECs were intended to be specially managed areas with specific goals, such as protecting and enhancing wildlife (BLM 1980). However, ACECs with special wildlife values are difficult to monitor and enforce without substantially greater staff resources. Restrictions to protect these areas are often violated by off-road vehicles and livestock intrusions, damaging habitat. And multiple uses, such as off-road vehicle use, livestock grazing, mining, and public utilities, have eroded and continue to erode the condition of wildlife resources in many of the ACECs that have been in existence since their designation in 1980. Invasive plant species have also degraded the habitat within ACECs (Aardahl 2005 pers. comm., USGAO 1991b). Without adequate conservation, management, and enforcement resources devoted to wildlife stewardship, BLM has been unable to protect these areas or implement adequate restoration projects and invasive species control programs to restore ecosystems and habitat values.

The CDCA Plan is undergoing a 20-year update through amendments divided among six area plans. Two plans cover the Mojave Desert: the Northern and Eastern Mojave Desert Management Plan (NEMO) and the proposed West Mojave Plan. The NEMO, approved in December 2002, established additional areas containing special protections for wildlife, including a determination that Surprise Canyon, Cottonwood Creek, and parts of the Amargosa River were eligible for designation under the Wild and Scenic Rivers Act. Two Desert Wildlife Management Areas (DWMAs) were designated for the protection of the desert tortoise, and ACECs were established to protect additional portions of the Amargosa River riparian habitat. The plans also call for reducing cattle and burro numbers in sensitive

habitats. While there has been a major effort to reduce burro numbers, resources have yet to be allocated to implement and enforce the other major provisions of NEMO and to provide prescribed protection levels of the Desert Wildlife Management Areas (BLM 2002, 2005b).

The latest version of the West Mojave Plan was released by BLM in spring 2006. Successful wildlife stewardship in the western Mojave planning area will require even greater conservation and enforcement resources than those in the northern and eastern Mojave, due to the more intensive development, recreation pressures, and other habitat-damaging land uses of the western Mojave. Rapid and full implementation of the Mojave area plans is necessary to prevent further degradation of wildlife habitat and the decline of wildlife populations.

Growth and Development

Within the Mojave Desert region, the west Mojave has the greatest land area with the fewest protections for maintaining wildlife diversity (TNC 2000b). The western Mojave has experienced tremendous growth over the last 20 years, and that trend is expected to continue. (See Fig. 7.3, Projected Development.) Collectively, the 11 incorporated cities of the western Mojave grew by 25 percent in the last decade, about double the statewide growth rate, and the region's population is expected to grow from 733,000 in 2000 to 1.5 million in 2036. Existing local government General Plans provide for residential growth in the western Mojave to reach a population of 5 million (BLM 2005b, Hunter et al. 2003). Significant growth is not anticipated in the eastern Mojave of California, where there is little infrastructure (BLM 2002b). But growth across the California-Nevada state border, in Pahrump and Las Vegas, will likely have increasing effects on the groundwater of California's eastern Mojave Desert.

In the western Mojave, sprawling development replaces and fragments desert habitat. Growing communities require additional rights-of-way for power lines, pipelines, and roads, further fragmenting habitat. This pattern and density of growth dramatically increases the severity of development's effects on wildlife (Hunter et al. 2003).

Development also increases pressure to overdraw groundwater. Groundwater levels began dropping as a result of overdrafting in the 1950s, drying up riverbeds, springs, and seeps and diminishing riparian ecosystems that depend on flowing water and saturated soils. The new water demands of rapid growth also reduce the options for recharging and restoring groundwater levels.

For more than a decade, federal, state, and local wildlife- and land-management agencies have worked to develop a multispecies regional conservation plan for the rapidly growing

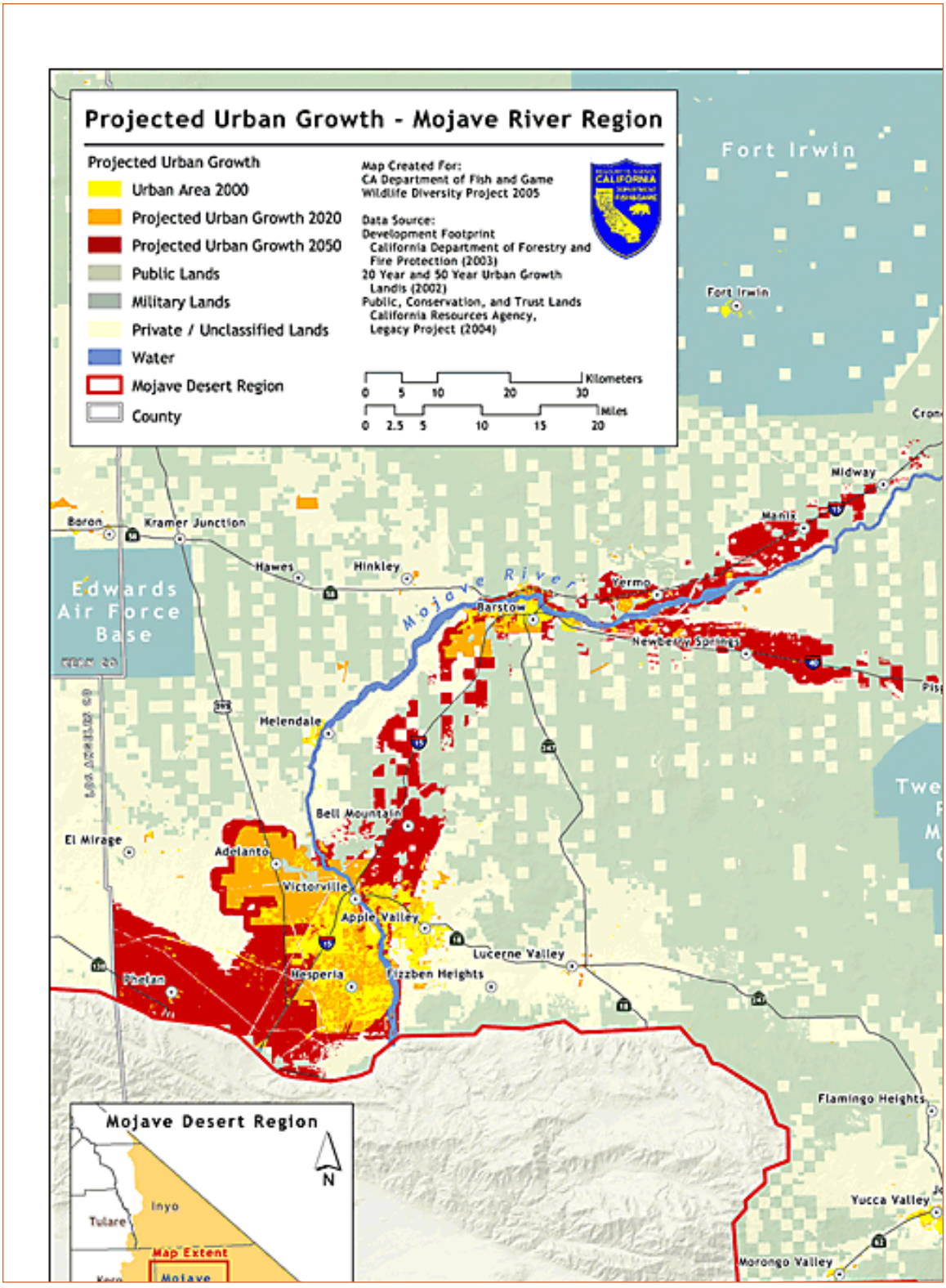


Fig. 7.3: Projected Development
The rapid growth in the Mojave River basin is fragmenting habitat and increasing demands on groundwater resources.

western Mojave. Its purpose is to conserve and protect the threatened desert tortoise and Mohave ground squirrel and nearly 50 other sensitive plants and animals and the natural communities of which they are a part, while accommodating anticipated rapid growth and development in the region (BLM 2005b). The challenge of developing the Plan is to design scientifically supported conservation measures and land-use restrictions that will ensure the long-term survival of all native species. The West Mojave Plan, as currently proposed, envisions that the conservation of species would occur primarily on existing public lands managed by BLM. A very limited amount of additional private lands within the proposed conservation area would be purchased or protected, in conjunction with facilitating development and expansion of desert cities and communities. This is not consistent with the other Southern California regional conservation planning efforts, because it will provide BLM funding to be used for conservation of species on lands they already manage rather than securing protection of species on important lands that are at risk of being developed (Morey 2003, 2005).

Groundwater Overdrafting and Loss of Riparian Habitat

Scattered riparian and spring ecosystems are the oases that serve as habitat for 75 percent of desert wildlife species, allowing them to exist and make use of the vast adjacent dry habitats. The Mojave River and the Amargosa River corridors are the major arteries of life for the Mojave Desert region, providing vital habitat for wildlife.

Surface water flows the length of the Mojave on average only once every 6 to 10 years. Perennial surface water had existed at three reaches of the river, in the Victorville-Helendale corridor, at Camp Cady east of Barstow, and in Afton Canyon. In the Victorville area, perennial surface water now exists at the Fish and Game–managed regional park and downstream in the Oro Grande area. Both owe their existence to some degree of discharges from adjacent water users—the Mojave Narrows Fish Hatchery and the Victor Valley Water Reclamation Authority. Local pumping has so lowered the water table at Camp Cady that no natural surface water has existed since the early 1990s. The record storm of early 2005, along with the purchase of water rights immediately upstream, may allow return of seeps and small ponds. Local faults and underlying clay layers create the conditions for the riparian corridor in the Victorville area as well as Camp Cady. However, local heavy pumping endangers these areas (Bilhorn 2005 pers. comm., CDFG 2004e, MWA 2004).

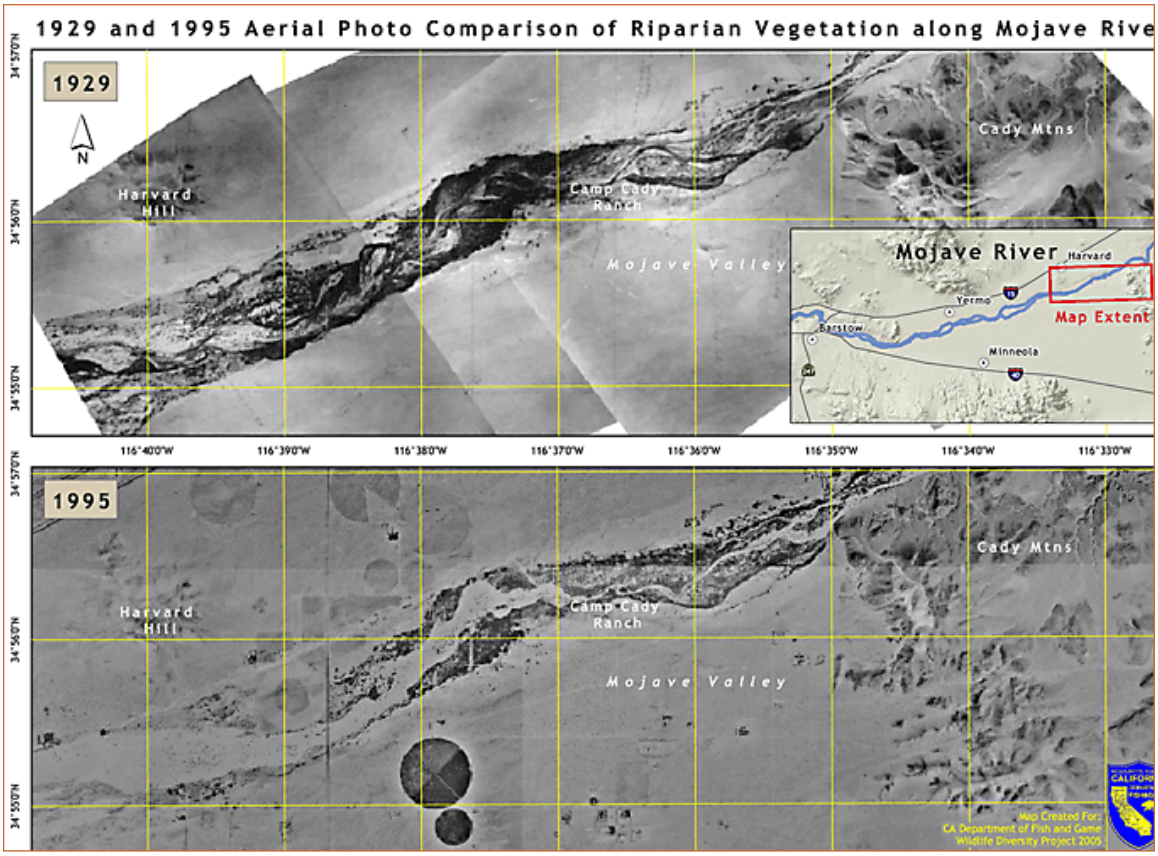


Fig 7.4: Riparian Vegetation Comparisons
The 1995 aerial photograph compared to the 1929 aerial photograph shows the dramatic decline in riparian vegetation along the Mojave River corridor. This riparian habitat decline is largely attributed to the receding groundwater levels.

Groundwater pumping for agricultural, industrial, and domestic uses in the Mojave Desert has lowered groundwater levels. Throughout the Mojave River basin, springs and riparian areas have dried up, causing water-stressed cottonwoods, willows, and mesquite to perish. In some areas, where groundwater levels dropped 7–10 feet, more than 50 percent of the cottonwood trees have perished. (See Fig. 7.4, Riparian Vegetation Comparisons.) Where the water table has dropped by 20 feet beneath the Mojave River, 95 percent of has died. Many of the remaining areas of the riparian corridor are dominated by tamarisk (saltcedar), an exotic plant that invades areas where the native riparian habitat is stressed. Tamarisk roots can reach deeper for water, causing groundwater to recede farther (Lines 1996b and 1999b, Smith 1999).

Development and demand for water have grown dramatically in the region. While natural inflows to the basin during the last decade have exceeded the long-term average, studies in-

dicate that groundwater levels have continued to drop. The human population in the Mojave region is expected to double over the next 30 years. Pressure to further overdraft groundwater in the Mojave basin will be intense, as the projected annual water deficit for the area will reach 60,000–80,000 acre-feet (AF) by the year 2020. The drafting of groundwater would be about double the average annual natural recharge of the aquifer (MWA 2004).

The 1995 court adjudication of water rights in the Mojave Basin, resolving conflicts among 1,000 groundwater pumpers, has provided a framework for managing and controlling groundwater production. The adjudication also established the Biological Resource Trust Fund, a $1 million revolving fund, which currently receives 65 cents (a figure that is indexed to inflation) per acre-foot of pumped water to support mitigation of damaged riparian habitat where agreed-upon groundwater levels have not been reached. However, this fund is not adequate to fully mitigate for declining riparian habitat. Today, groundwater levels along some sections of the Mojave River have receded below the safe levels as defined in the adjudication, and riparian habitat continues to decline (CDFG 2004e).

Stabilizing and increasing groundwater levels, in part by recharging overdrafted subbasins, are essential to maintaining riparian habitats, allowing riparian-dependent wildlife to return to several sections of the Mojave River and adjacent streambeds. The Mojave Water Agency (MWA) has developed a plan to recharge the groundwater basin that would require importing about 59,000 AF of water per year by 2020 to maintain groundwater at levels that would support riparian habitats along the river and its tributaries. Recharging the region will likely require increasing water purchases from the State Water Project and other outside sources.

Groundwater overdrafting also imperils the Amargosa River basin riparian habitat and wetlands, and groundwater pumping in the Amargosa Valley and in the upstream watershed is expected to increase. Increasing water use by expanding residential communities is projected in the upper basin region of Amargosa Valley and Pahrump, Nev. Ten thousand new homes have already been approved for construction in the community of Pahrump. In addition, the city of Las Vegas also is seeking to tap into the groundwater basins of the surrounding rural areas in Nye County, Nev. The Pahrump Valley is itself short of water for predicted local growth and is among the areas being examined to export water to Las Vegas (Christian 2005 pers. comm., Moyle 2002). If the Amargosa River Basin is overdrafted, wildlife diversity will decline in Ash Meadows, the Amargosa Canyon, and in Death Valley National Park as the Amargosa riparian corridor withers.

Inappropriate Off-Road Vehicle Use

Desert plant communities of the Mojave Desert are thousands of years old, and much of the long-lived vegetation established roots several hundred to several thousand years before the first European explorers set foot on the West Coast (Koehler et al. 2005, Van Devender 1999, Vasek 1995, Vasek and Barbour 1988). Limited by available moisture, plants grow slowly over decades. Soil structure and the biological soil crust upon which plants and animals depend were created by processes over millennia (Belnap 2002, Boarman and Berry 1995, Cody 2000, Haley and Bainbridge 1999, Lovich and Bainbridge 1999). Unique species of mammals, reptiles, and birds have evolved in association with these ancient habitats.

The impacts of off-road vehicles on these fragile desert landscapes have been described by scientists and resource managers for more than 30 years (Stebbins et al. 1978, Webb and Wilshire 1983). The 1980 California Desert Conservation Area Plan referred to off-road vehicles as the "most pervasive management issue in the area." Along with direct collisions with desert tortoises and other wildlife and the crushing of animal burrows, off-road vehicles compact soils, induce erosion, spread invasive plant species, and denude the landscape of vegetation. Off-road driving or riding has essentially a nonrestorable impact on some desert habitat; damaged soils and perennial vegetation are not likely to recover for several hundred years or more (Haley and Bainbridge 1999). Revegetation efforts on disturbed upland areas of the Mojave are expensive and have had little success.

The number of off-road vehicle registrations in California has more than doubled since 1980, and the rapid growth of the numbers of off-highway vehicle recreationists continues. In addition to resident recreationists, the Mojave Desert attracts 2 million off-road vehicle visitors annually. While the vast majority of motorcyclists and all-terrain vehicle riders are responsibly recreating at designated off-road vehicle parks or on designated trails and roads on public lands, many others are carving new trails across threatened desert tortoise and Mohave ground squirrel habitat, often across sensitive habitats in closed portions of designated Areas of Critical Environmental Concern (ACEC). For example, BLM closed the 18,000-acre West Rand ACEC to off-road vehicle use in 2002 due to extensive damage to critical habitat for the desert tortoise. However, off-road vehicle users have routinely violated the closure (DMG 2002b).

While desert planning efforts attempt to minimize off-road vehicle damage to natural resources by designating open, limited use, and closed areas, damage to natural resources continues. The lack of public education regarding the rules and road networks, lack of ad-

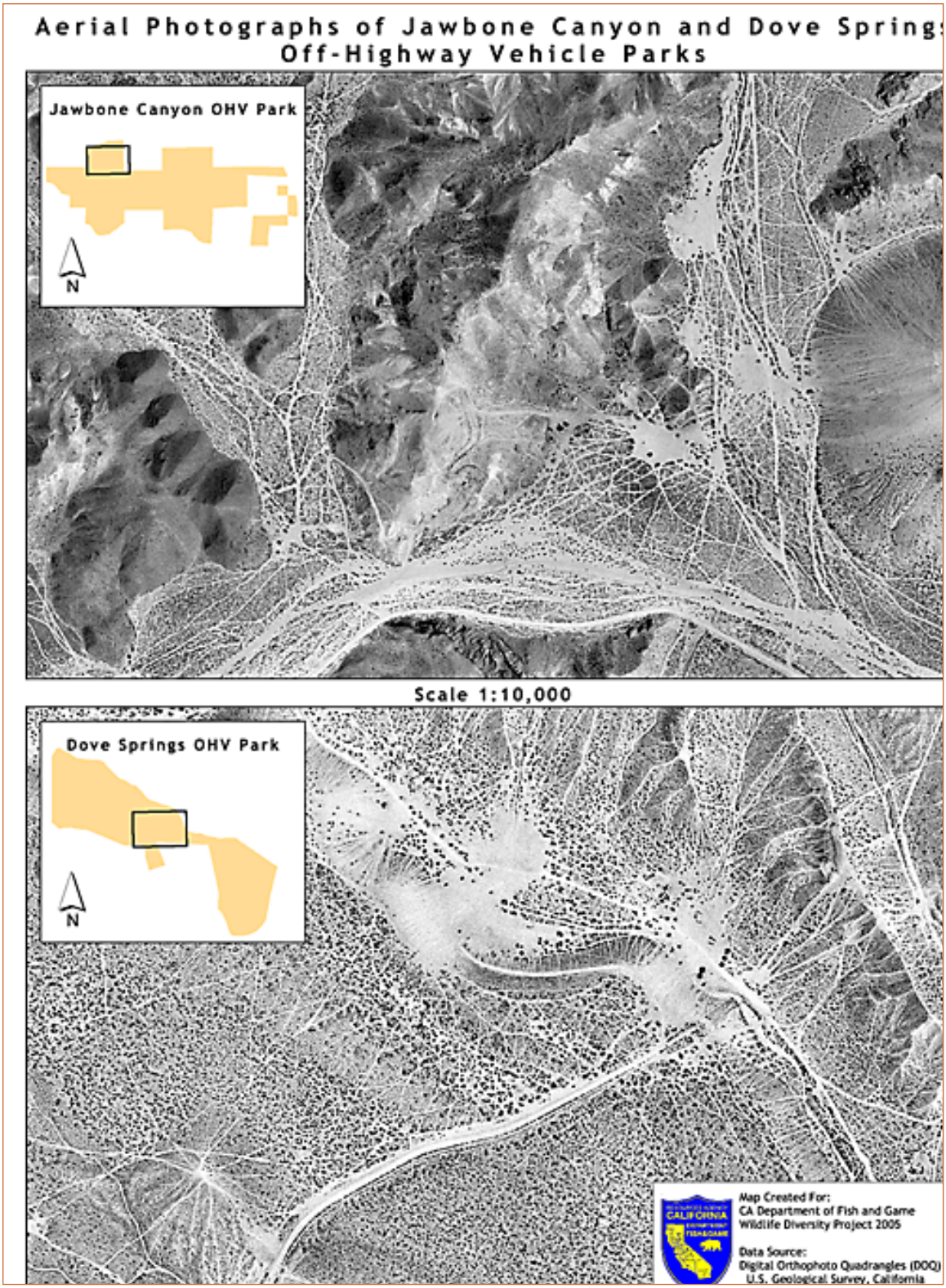


Fig. 7.5: Aerial Photographs of OHV Parks
Off-road vehicle tracks can clearly be seen. Some tracks continue out of the OHV Park and into Areas of Critical Environmental Concern (ACEC).

equate enforcement staff, and outright defiance by a small segment of the off-road vehicle community have thwarted efforts to protect wildlife and vegetation, including areas around desert springs and other sensitive sites.

Only two or three BLM rangers per 1 million acres are assigned to patrol the Mojave Desert, so the risk of receiving a citation for riding in restricted areas is very small. Agencies in the region have posted signs indicating where vehicles are prohibited, but in many areas this is futile. BLM concluded in the June 2003 Decision Record for the Western Mojave Desert Off-Road Vehicle Designation Project:

> "The least effective short-term action taken in the Ord Mountains was signing the closed route network. Not only did this effort consume a great deal of staff time; in addition, signs were removed almost as quickly as they were put up. The need to resign routes placed additional demands on scarce staff time and material."

The Decision Record also revealed that BLM was unable to keep off-road vehicles out of sensitive areas. The frequent destruction of signs led BLM to sign the open route network and to cease signing the closed areas, reasoning that people are less likely to destroy "open area" signs than "closed area" signs. While this saves signs, this policy makes it difficult to inform recreationists where off-road vehicle activities are prohibited, providing less protection for important habitats. Even though the route-designation decision for the western Mojave area was signed by BLM in June 2003, the route designations have not been implemented (Aardahl 2005 pers. comm.).

Sensitive habitats are particularly at risk where off-road vehicle parks or open areas are located on lands adjacent to those habitats. For example, riparian vegetation in the Jawbone-Butterbredt ACEC is routinely crossed by vehicles straying from the Jawbone and Dove Spring Canyon off-highway vehicle open areas (See Aerial Photographs of Jawbone Canyon and Dove Springs Off-Highway Vehicle Parks, Fig. 7.5). The El Mirage and the Spangler Hills off-highway vehicle open areas are contiguous to the Fremont-Kramer Desert Wildlife Management Area (DMG 2002b).

Excessive Livestock Grazing

Excessive livestock grazing has altered ecosystems across the Mojave. Grazing has been particularly detrimental to the wetland and riparian habitats important for maintaining wildlife diversity in the desert, denuding and eroding fragile soils around rivers, springs, and seeps and polluting scarce surface water. Livestock reshape streambeds and trample and consume vegetation and seedlings of native trees and shrubs, preventing regeneration.

Grazing has also altered the desert scrub ecosystems, reducing preferred native shrubs and herbaceous plants that support the desert tortoise and other reptiles, the Mohave ground squirrel, and other small mammals, birds, and butterflies (Avery 1999). Heavy grazing also facilitates the spread of cheatgrass and other invasive annual grasses, replacing native grasses, herbs, and perennial shrubs, further diminishing habitat conditions for wildlife (Barbour et al. 1993). In turn, fires are more frequent where invasive annual grasses are abundant, preventing the natural restoration of native vegetation and further disturbing habitat for native wildlife.

Since 1994, nearly 60,000 **Animal Unit Months** (AUMs) for cattle have been approved by BLM on 3.5 million acres of the Mojave Desert region spread across 25 allotments (USFWS 1994c). (An animal unit month is defined as the amount of forage required to sustain one cow and calf or one horse or five sheep for one month.) In some portions of the Mojave, livestock grazing has been reduced to lessen impacts on the desert tortoise and other wildlife. Since 1991, BLM has prohibited domestic sheep grazing on 800,000 acres of desert tortoise critical habitat and has implemented seasonal restrictions on cattle grazing in some allotments to protect tortoises (USGAO 2002). The National Park Service has dramatically reduced grazing in the Mojave National Preserve. Sheep grazing has been halted in tortoise habitat of San Bernardino County, based on agreement among scientists and resource agencies that sheep grazing significantly degraded feed and habitat for the threatened desert tortoise. However, sheep and cattle continue to graze in wildlife habitats, including desert tortoise habitat, in the western Mojave areas within Inyo and Kern Counties (DMG 2002b). Cattle graze within ACECs and in areas designated as critical habitat for the desert tortoise, and they continue to degrade riparian habitats vital to numerous birds and mammals (BLM 2005b).

Excessive Burro and Horse Grazing

The 1971 Wild Free-Roaming Horses and Burros Act requires BLM to manage wild free-roaming horses and burros "in a manner designed to achieve and maintain a thriving natural ecological balance on public lands." The bureau is also required to remove horses and burros where overpopulation exists "in order to restore a thriving ecological balance to the range."

Although they have inhabited the West since the end of the 16th century, burros and horses have likely grazed the California desert in significant numbers since they were released by settlers and miners in the 1800s (Beever 2003, McKnight 1958). Descendents of wild asses from northeastern Africa, burros are well-adapted to the desert environment, and they

readily propagate in Mojave Desert habitats where water and forage occur. Horses, although less adapted to the desert, have established herds in a few areas. BLM established appropriate management levels (AMLs) for burro and horse herds in the Mojave Desert pursuant to the amended California Desert Plan of 1980. The levels were mostly established in the 1980s, based on the range capacity for grazing rather than on limits that would protect wildlife habitat and sensitive plant and animal species.

The AMLs for burro and horse numbers are often greatly exceeded. Between 1981 and 1987, 18,700 burros were removed from the desert, but, since 1987, efforts to control burros have been limited due to lack of funding. Today there are 13 burro- and a few horse-herd areas in the Mojave region. Burro numbers exceed the AML in five of the 13 herd areas. In one management area, there are 280 horses where the AML is 168 horses (BLM 2004b).

Excessive burro numbers have led to overgrazing and degradation of desert resources. Riparian habitats associated with seeps and springs are often denuded and trampled by burros and horses. Water quality at seeps and springs frequented by burros or horses is usually poor due to accumulated sediment, urine, and feces. Feral burros and horses, exotic animals in the desert, place additional stress on the natural ecological balance of sensitive desert habitats (Aardahl 2005 pers. comm., La Pre 2004 pers. comm.).

Invasive Plants

Numerous exotic non-native plants have altered plant communities across large areas of the Mojave Desert, outcompeting native species and degrading upland and riparian habitats for native wildlife. Invasive annual grasses and **forbs** have displaced native plants, often greatly diminishing the native forage for the desert tortoise, lizards, birds, and small mammals. These exotic grasses and forbs now dominate plant communities throughout the region. In desert tortoise critical habitat of the western Mojave, exotic plants account for more than 60 percent of the annual vegetative biomass (Berry 1999, Brooks and Matchett 2002, DeFalco and Brooks 1999). Some invasive plants, such as Saharan mustard, continue to spread across the region.

The abundance of exotic forbs and annual grasses (particularly *Schismus barbaratis, S. arabicus,* and *Bromus madritenus rubens*) increases the fuel and continuity of fuels, facilitating more-frequent and hotter fires. This destroys the less-fire-intolerant native plants and facilitates other exotic plants that thrive in disturbed areas, further transforming the plant communities (Brooks and Matchett 2002, Brooks and Pyke 2001, D'Antonio 2000).

Imported tamarisk, a plant of inferior habitat value for native wildlife, has replaced native cottonwoods and willows in much of the riparian habitat of the Mojave River and of other watercourses in the region. A 1995 survey found that tamarisk dominated half of the 10,000 acres of riparian habitat along the Mojave River (Holmes et al. 2001, Lines 1999a). The leaves of tamarisk concentrate and shed salts, degrading soil conditions for native plants (Smith 1999). Tamarisk is more drought tolerant than native cottonwood trees and willows. In areas where groundwater levels are receding, tamarisk outcompetes water-stressed native plants (Cleverly et al. 1997, Lovich 2000).

Various local, state, and federal agencies have implemented projects to remove and control tamarisk. However, the priority areas for tamarisk removal and habitat restoration do not correspond to jurisdictional boundaries. The Desert Managers Group is coordinating a regional response to restoring riparian habitats invaded by tamarisk and is seeking funding for the regional effort (DMG 2004).

In 2002, local, state, and federal agencies signed the Mojave Weed Management Area (WMA) Memorandum of Understanding (MOU), which spells out a coordinated planning effort to prevent, control, and eradicate weeds and to educate the public about weed control in the region (DMG 2002a). The MOU identifies a priority list of species to control in the Mojave. Implementation of the Mojave WMA plan is limited by available funding.

Table 7.3: Mojave Weed Management Area Target Species

Ailanthus altissima	Tree of Heaven
Alhagi camelorum	Camel thorn
Arundo donax	Giant reed
Brassica tournefortii	Sahara mustard
Bromus madritensis	Red brome
Centaurea solstitialis	Yellow starthistle
Halogeton glomeratus	Halogeton
Linaria dalmatic	Dalmation toadflax
Pennisetium setaceum	Fountain grass
Salsola tragus	Russian thistle
Solanum elaegnifolium	White horsenettle
Tamarix ramosissima	Tamarisk (saltcedar)
Tribulus terrestris	Puncture vine

Military Land Management Conflicts

Military training activities utilize large areas of the Mojave landscape. Bases and training centers occupy 2.6 million acres, or 13 percent, of the land area. Some of the most degraded lands and some of the most pristine habitats are on lands managed by the Department of Defense. In areas of the U.S. Army's National Training Center at Fort Irwin and the Marine Corps Air Ground Combat Center at Twentynine Palms, where warfare is practiced with heavy tracked armored vehicles, significant tracts are nearly denuded of plants, and the soils are hard packed. However, in other areas of Fort Irwin, Edwards Air Force Base, and China Lake Naval Air Weapons Station (NAWS) there exist some of the best representative habitats of the desert region, protected from public access and destructive land uses. There is no formal protection for these quality habitats; thus, as the military's mission evolves, base operations may change, with consequences for the remaining good habitat areas (Jones 2004 pers. comm., Lynn 2005 pers. comm.).

Military bases and operations affect wildlife habitat in two ways: Construction of base facilities and support communities eliminates and fragments wildlife habitats, much like other development, and field training, with tank maneuvers and air-to-ground bombing, can damage habitat (Lovich and Bainbridge 1999, USFWS 1994c).

Expanding base infrastructure and areas of heavy use would cause the additional loss of important habitat for the desert tortoise and other species. Fort Irwin, for example, has annexed an additional 110,000 acres to expand its training area, causing the loss of desert tortoise and Mohave ground squirrel habitat. Mitigation for this base expansion will involve relocating hundreds of tortoises, buying out and retiring the cattle-grazing permits on other lands to improve conditions for these species, and acquiring private land that is critical habitat for the desert tortoise (LaRue 2000, Lynn 2005 pers. comm.).

Federal law requires the military to prepare and implement an Integrated Natural Resources Management Plan (INRMP) for each military installation to address the management and conservation of wildlife habitats and species. Significant funding is allocated to implement these plans and, in particular, implement the plan provisions to address threatened and endangered species. State and federal wildlife agencies are consulted in the development of the INRMPs. However, their input is only advisory, and their recommendations regarding actions to protect species may or may not be incorporated into the plans.

Department of Defense conservation staff are actively involved in cooperative efforts with state and federal agencies and some nongovernment organizations to conduct wildlife

research and to implement conservation projects. For example, Edwards Air Force Base has installed fencing to protect critical desert tortoise habitat and has cleaned up tortoise hazards by plugging 42 old mine shafts and wells. On China Lake NAWS there is one of the few remaining populations of Mohave tui chub, and that station's staff monitor the population. The military is a member of the Desert Managers Group and is an important partner, engaged in research, conservation, and restoration (DMG 2002a, 2002b, 2002c, 2005).

Mining Operations

Mineral commodities extracted from the Mojave Desert include lead, zinc, gold, silver, copper, sand, gravel, limestone, gypsum, sodium, and borates. The desert also provides minerals from evaporative deposits that are used in filtration systems, chemical refining, ceramics, and drilling muds. In 1990, nearly 40 percent of the gold extracted in California came from the Mojave Desert. Gold mining continues to be important in the region. In the West Mojave, there are 160 authorized mining plans, with operations at about 25 mines at any one time. Most active mines are on fewer than 10 acres each (BLM 2003a, Lovich and Bainbridge 1999, Schoenherr 1992).

On BLM-managed lands, approved mining operation plans are required if a project will remove 1,000 tons of material, five acres are disturbed, or the mining activity is proposed on lands classified as multiple-use areas, Areas of Critical Environmental Concern, endangered species critical habitat, national wilderness preservation system lands, national monument, or other protected sites. Mining plans may include approval for disposing of mine wastes on public lands.

Mining has harsh environmental impacts in localized areas scattered across the Mojave Desert. At thousands of mine sites in the desert, mining roads, tailing mounds, pits, ore piles, and chemical runoff scar the natural landscape. Pit mining and dry-lakebed mineral projects are sources of chemical-laden dust that drifts, depositing it over large land areas. Uncovered mine leachate ponds are a hazard for waterfowl, shorebirds, bats, and other species. Cyanide-heap leaching of gold recovery operations has the potential to kill a variety of wildlife if not properly managed. Also, renewed earth-moving and mining operations around old mine sites can destroy important bat roosts.

Conservation Actions to Restore and Conserve Wildlife

In addition to the recommended regional actions described below, see the recommended statewide conservation actions as given in Chapter 4 and action "b" in the Colorado Desert chapter related to the Lower Colorado River Multi-Species Conservation Plan.

a. Improve stewardship on federally managed lands to protect wildlife diversity.

- Congress should allocate significantly greater staff and resources to BLM for implementation of wildlife conservation activities, habitat restoration, and enforcement of off-road vehicle and grazing restrictions.
- Congress should fund BLM and its partner federal and state agencies to fully implement the Desert Tortoise Recovery Plan and the wildlife protection provisions of the Northern and Eastern amendments to the CDCA Plan (including the special protections for the Ivanpah-Shadow and Piute Eldorado DWMAs and for the Afton Canyon, Amargosa River, and Carson Slough ACECs).
- Congress should fund BLM to fully implement the wildlife protections authorized for ACECs throughout the Mojave region. Activity Plans for the ACECs should be updated and implemented. Goals for enforcement should be established and implemented in these special habitat areas to prevent habitat degradation by unauthorized activities.

b. Stabilize groundwater levels and recharge depleted sub-basins of the Mojave River Basin, restoring groundwater to levels that support riparian habitat.

- The court-adjudicated groundwater management agreement of the Mojave River Basin should continue to ramp down the free production rights for groundwater and use all means possible to increase importation of water to alleviate the current groundwater overdraft and to meet growth demands.
- The state should consider providing matching funds to be used in conjunction with funds of the Biological Resources Trust Fund for the benefit of restoring riparian habitat along the Mojave River corridor.
- The Wildlife Conservation Board, federal resource agencies, and nongovernmental conservation organizations should secure additional water rights throughout the basin for wildlife resources. Additional agricultural lands with water rights should be purchased to set aside water for wildlife resources.

c. Stabilize groundwater levels and secure wet habitats in the Amargosa River Basin. This action will help protect the endangered Amargosa vole and the Amargosa pupfish, among other species.

- California and Nevada should establish a groundwater overdraft prevention policy for the Amargosa Basin and seek agreement on an MOU to implement the policy. Federal legislation

should protect the groundwater and wet habitats of the Amargosa River Basin if the states cannot resolve the issues.

- The State Water Resources Control Board should work with federal agencies and nongovernmental organizations to secure water rights for wildlife and riparian habitat in the basin.
- BLM should fully document water resources, wildlife, and biological attributes in the Amargosa River ACEC and assess instream flow requirements to maintain aquatic ecosystems and wildlife resources within the ACEC and the Kingston Range Wilderness Area.

d. Provide maximum federal and state protection for remaining riparian, spring, seep, and wetland habitats, and restore degraded riparian, spring, seep, and wetland areas.

See Statewide Action g, Chapter 4.

Conserving these wet habitats is key for maintaining wildlife diversity in the desert.

- State and federal wildlife and land management agencies should create a Mojave Riparian and Spring Habitat Taskforce to provide oversight and focus to restore and protect these habitats.
- The state should establish a riparian, spring, and wetland habitat degradation-prevention policy for the desert. Flood control and other activities should be excluded from riparian, spring, and wetland areas unless they are proven not to have a negative effect on ecosystem function and wildlife diversity.
- State and federal agencies should expand efforts to work with ranchers to conserve and restore riparian habitats on private lands. Such efforts may involve developing water sources outside of riparian areas and then excluding livestock from these habitats.
- State and federal land management agencies should work with the off-road vehicle community to reduce impacts of off-road vehicles on sensitive riparian, spring, and wetland habitats and establish half-mile buffers around identified sensitive sites.
- Federal land managers should continue to reduce burro and horse numbers where they have a detrimental effect on riparian and other sensitive habitats for wildlife by assessing the number of burros and horses on the specific sensitive sites, and calculating and implementing new appropriate management levels of burros and horses that will protect these sites.
- BLM managers should seek funding to fully implement the provisions of the California Desert Conservation Act Plan for protection and restoration of unusual plant assemblages classified as wetland riparian.

e. The Bureau of Land Management should improve, and, upon approval, implement the West Mojave Plan with conservation measures to address all special status species and to maintain wildlife diversity.

- The proposed West Mojave Plan must provide scientifically sound measures to ensure recovery of the Mohave ground squirrel and the desert tortoise and the protection of other species

covered in the plan in a manner that precludes the need to consider listing them in the future. The proposed plan identifies 49 species that it would cover and make eligible for take permits pursuant to state and federal endangered species law (Morey 2005).

- The plan should assist in funding protective measures called for in previously approved conservation and recovery plans and ACEC management plans.
- The plan should provide for independent monitoring of species and ecosystems and have a mechanism to adapt conservation measures to new information and changes in the status of species.
- The plan should include a reliable funding plan, supported by the Department of Interior, for additional BLM positions, conservation activities, and adaptive management that would be described in the implementation agreement and is above and beyond existing management obligations.

f. Reduce off-road vehicle damage to wildlife habitats.

- State and federal wildlife agencies should work with State Parks and federal land managers to identify and permit additional sites for quality off-road vehicle recreation where there would be minimal conflict with wildlife restoration and conservation goals.
- State and federal land management agencies should identify all off-highway vehicle open-area boundaries and provide adequate driver/rider education and increased enforcement.
- Enlarge exclusion buffer areas between off-highway vehicle parks and sensitive closed areas. Avoid designating parks and open areas for these vehicles near closed areas for sensitive habitat.
- Increase fines and penalties for illegal off-highway vehicle use at designated riparian and sensitive-habitat closed areas.
- Provide land managers with adequate staff and resources to manage and enforce off-highway vehicle activities.

g. Federal, state, and local agencies should provide greater resources and coordinate efforts to eradicate or control existing occurrences of invasive species and to prevent new introductions.

See Statewide Action g, Chapter 4.

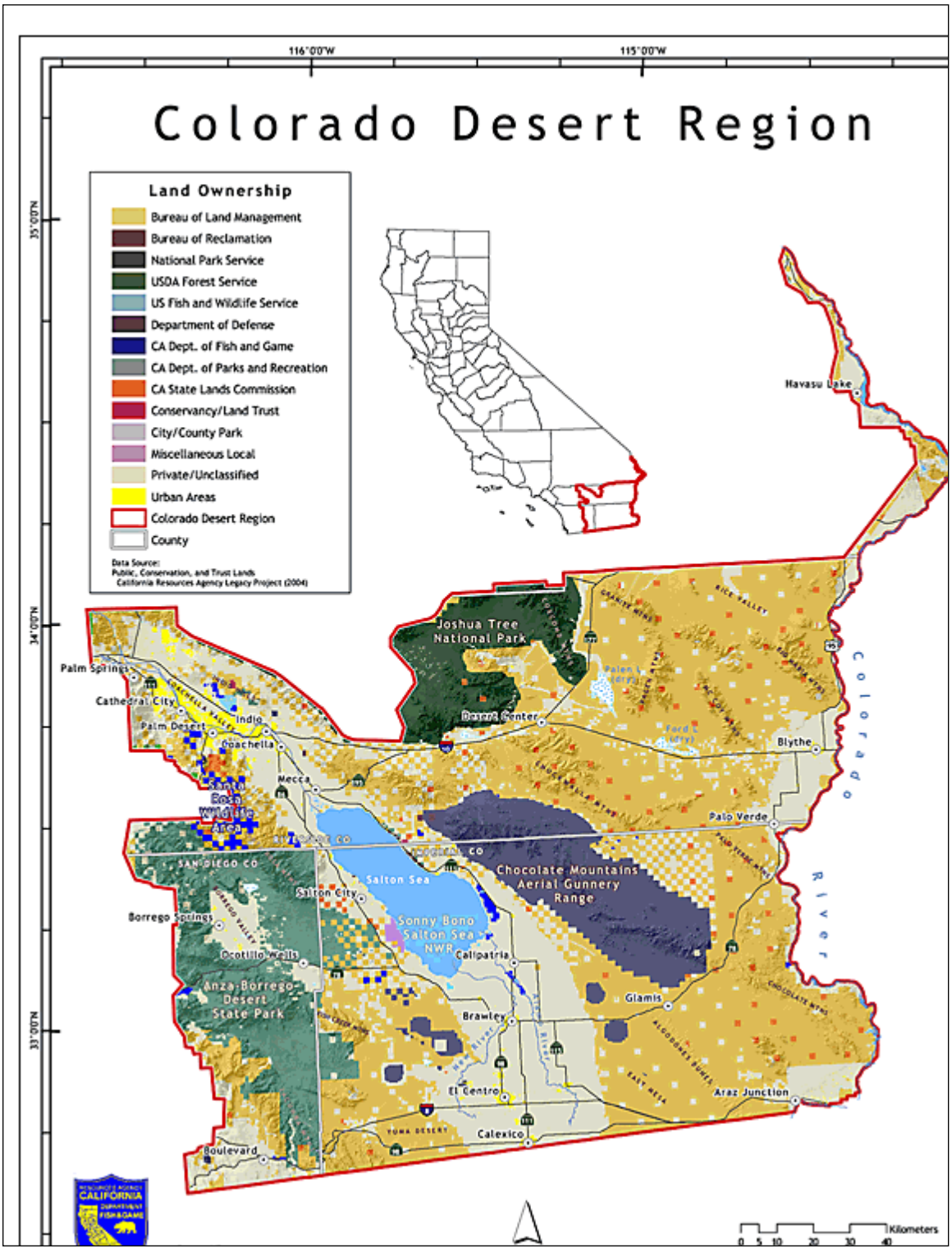
- Increase funding for coordinated regional efforts to remove tamarisk and restore riparian ecosystems.
- Increase funds for research on biological control of Sahara mustard and other prolific invasive species.

h. Fully implement the recovery plans for the Mojave tui chub, Amargosa vole, and Inyo California towhee.

- Update regional conservation plans to meet the requirements for recovery of species as identified in the recovery plans.
- Devote adequate resources to update and implement the recovery plans.

i. Fish and Game, BLM, and the three military bases that support the Mohave ground squirrel should develop a collaborative conservation and recovery strategy for the Mohave ground squirrel so that federal listing is not necessary.

The conservation strategy should include field studies and genetic analyses to clarify the status of squirrel populations and a plan to acquire squirrel habitat core areas and connecting corridors.


Colorado Desert Region
116°00'W
115°00'W
35°00'N
34°00'N
33°00'N
Land Ownership
Bureau of Land Management
Bureau of Reclamation
National Park Service
USDA Forest Service
US Fish and Wildlife Service
Department of Defense
CA Dept. of Fish and Game
CA Dept. of Parks and Recreation
CA State Lands Commission
Conservancy/Land Trust
City/County Park
Miscellaneous Local
Private/Unclassified
Urban Areas
Colorado Desert Region
County
Data Source:
Public, Conservation, and Trust Lands
California Resources Agency Legacy Project (2004)
Havasu Lake
Joshua Tree National Park
Desert Center
Palm Springs
Cathedral City
Palm Desert
Indio
Coachella
Mecca
Blythe
Palo Verde
Salton Sea
Salton City
Chocolate Mountains Aerial Gunnery Range
Sonny Bono Salton Sea NWR
Calipatria
Borrego Springs
Ocotillo Wells
Anza-Borrego Desert State Park
Brawley
Glamis
El Centro
Araz Junction
Calexico
Boulevard
SAN DIEGO CO
IMPERIAL CO
Colorado River
CALIFORNIA
DEPARTMENT FISH & GAME
Kilometers
0 5 10 20 30 40